



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/647,454	08/26/2003	Makoto Kitano	Q76961	3244
23373	7590	04/10/2008	EXAMINER	
SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			YAMNITZKY, MARIE ROSE	
			ART UNIT	PAPER NUMBER
			1794	
			MAIL DATE	DELIVERY MODE
			04/10/2008	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/647,454

**Applicant(s)**

KITANO ET AL.

**Examiner**

Marie R. Yamnitzky

**Art Unit**

1794

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date: \_\_\_\_\_

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 18, 2007 has been entered.

2. Applicant's amendment filed October 18, 2007 amends claims 1, 4, 6 and 7. Claims 1 and 3-24 are pending.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. The rejection under 35 U.S.C. 112, 2<sup>nd</sup> paragraph, as set forth in the Office action mailed April 19, 2007 is overcome by claim amendment.

The rejection under 35 U.S.C. 103(a) based on Woo et al. (US 6,309,763 B1) is withdrawn in consideration of applicant's arguments and the data of record in the specification. While Woo's generic disclosure encompasses polymers having a repeating unit of formula (1) wherein the E variables are aryl groups (A) as defined in present claim 1, Woo provides no specific examples of a polymer within the scope of the present claims, Woo's preferred polymers are outside the scope of the present claims, and the data of record in the specification demonstrate superior results obtained with polymers within the scope of present claim 1 versus a polymer that is also within the scope of Woo's generic disclosure but outside the scope of

present claim 1. Woo's teachings do not suggest the superior results demonstrated in the present specification.

4. Applicant's arguments filed October 18, 2007 have been fully considered with respect to the Kreuder et al. patent. Kreuder et al. was previously applied against polymeric compounds comprising a repeating unit of formula (1). The examiner agrees that Kreuder et al. do not disclose or suggest a polymeric compound comprising a repeating unit of formula (1) as defined in present claim 1 but notes upon further consideration that Kreuder's polymer of formula (1) also provides polymeric compounds comprising a repeating unit of formula (2) as defined in present claim 1.

5. The claims remain subject to an election of species. Claims 1 and 3-24 continue to read on the elected species.

The prior art does not disclose or suggest a polymer compound comprising a repeating unit of formula (1) as defined in present claim 1 wherein  $E_1$ ,  $E_2$  and  $E_3$  each independently represent an aryl group (A) as defined in present claim 1, a and b each independently represent 0 or 1, and  $a + b = 1$  (this patentable subject matter encompasses applicant's elected species). However, the prior art does disclose or suggest other non-elected species within the scope of claim 1 and claims dependent therefrom as set forth below.

6. Claims 1 and 3-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kreuder et al. (US 5,814,244).

See the whole patent. In particular, see column 2, line 8-c. 6, l. 50 (especially, the two formulae at c. 6, l. 25-31), c. 17, l. 53-c. 18, l. 29, and the claims.

Kreuder et al. provide for polymers comprising a repeating unit of present formula (2) wherein n is 2 and each of l, m, n and p is 0. A polymer of formula (I) according to Kreuder et al. in which n is 2, Ar<sup>3</sup> represents the same group as Ar<sup>5</sup>, and each of Ar<sup>2</sup> and Ar<sup>4</sup> represents a group of the first formula at c. 6, l. 25-31 is a polymer comprising a repeating unit of present formula (2) in which each of E<sub>8</sub> and E<sub>9</sub> represents a heterocyclic group. A polymer of formula (I) according to Kreuder et al. in which n is 2, Ar<sup>3</sup> represents the same group as Ar<sup>5</sup>, and each of Ar<sup>2</sup> and Ar<sup>4</sup> represents a group of the second formula at c. 6, l. 25-31 is a polymer comprising a repeating unit of present formula (2) in which each of E<sub>8</sub> and E<sub>9</sub> represents an aryl group. The substituted heterocyclic group of the first formula at c. 6, l. 25-31 further meets the limitations of heterocyclic group (B') as defined in claim 6, with claims 7-9 dependent therefrom. The substituted aryl group of the second formula at c. 6, l. 25-31 further meets the limitations of aryl group (A') as defined in claim 6, with claims 7 and 8 dependent therefrom.

Kreuder et al. do not disclose a specific example of a polymer within the scope of the present claims, and do not limit the number-average molecular weight of the polymers. Kreuder et al. disclose polymers within Kreuder's generic formula (I) having number-average molecular weights within the range set forth in present claim 1. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to make other compounds within the

scope of Kreuder's generic formula (I), such as polymers in which each of  $Ar^2$  and  $Ar^4$  represents a group of the first or second formula at c. 6, l. 25-31. It would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable and optimum number-average molecular weights for the polymers and, guided by the examples provided by Kreuder et al., would have reasonably expected number-average molecular weights within the range set forth in present claim 1 to be suitable for Kreuder's polymers.

Present claims 3, 4 and 10 further define aryl group (A). Aryl group (A) is a component of the repeating unit of formula (1). While further defining aryl group (A), claims 3, 4 and 10 are not limited to a polymer comprising a repeating unit of formula (1). Kreuder et al. suggest polymers within the scope of claims 3, 4 and 10 wherein the polymer is a polymer of claim 1 comprising a repeating unit of formula (2).

With respect to present claim 5, polymers having a repeating unit of formula (2) wherein  $Ar_5$ ,  $Ar_6$  and  $Ar_7$  represent a group shown by formula (2P) are provided by the prior art when n is 2 and  $Ar^1$ ,  $Ar^3$  and  $Ar^5$  of prior art formula (I) are identical and represented by the first, third or fifth formula in column 3, or first or fifth formula in column 4. Polymers having a repeating unit of formula (2) wherein  $Ar_5$ ,  $Ar_6$  and  $Ar_7$  represent a group shown by formula (2P) are also provided by the prior art when n is 2,  $Ar^3$  and  $Ar^5$  of prior art formula (I) are identical and represented by the first, third or fifth formula in column 3, or first or fifth formula in column 4, and  $Ar^1$  is the same or different from  $Ar^3$  and  $Ar^5$  and represented by the first, third or fifth formula in column 3, or first or fifth formula in column 4.

With respect to present claim 11, Kreuder's general formula (I) provides for copolymers comprising a repeating unit of present formula (2) and a repeating unit of present formula (4), (6) or (7) wherein  $Ar_{12}$  represents an arylene group or divalent heterocyclic group, and  $X_2$  represents  $-CR_2=CR_3-$ .

With respect to present claims 12-20, see c. 2, l. 46-52 and c. 17, l. 53-c. 18, l. 25.

Further with respect to present claim 14, Kreuder's examples include the manufacture of an electroluminescent (EL) device by applying a solution of a polymer of Kreuder's general formula (I). Kreuder et al. do not disclose the viscosity of the solution, or limit the viscosity of a solution of the polymer. It would have been within the level of ordinary skill of a worker in the art at the time of the invention, as a matter of routine experimentation, to determine suitable and optimum viscosities for solutions to be used for device fabrication. For example, one of ordinary skill in the art knows that it is easier to form thinner coatings/films with a less viscous solution.

With respect to present claims 21-24, see c. 18, l. 25-29 for example. It was known in the art at the time of the invention to incorporate EL devices into displays such as claimed in present claims 22-24. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to incorporate an EL device according to Kreuder et al. in types of displays in which EL devices were known to be useful at the time of the invention.

7. Claims 1, 3-5 and 10-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lamansky et al. (US 2004/0004433 A1).

Polymers of Formula 30 as shown on page 9 of Lamansky's publication are polymer compounds comprising a repeating unit of formula (2) as defined in present claim 1 wherein n is 2, each of l, m, o and p is 0, each of Ar<sub>5</sub>, Ar<sub>6</sub> and Ar<sub>7</sub> is an arylene group, and each of E<sub>8</sub> and E<sub>9</sub> is an aryl group (the other Ar and E variables shown in formula (2) are not present when l, m, o and p are 0). The only limitation of a polymer compound according to present claim 1 that is not expressly taught by Lamansky et al. with respect to Lamansky's Formula 30 is the polystyrene reduced number average-molecular weight. It would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable and optimum number-average molecular weights for the polymers. Lamansky provides a specific example of a polymer of Formula 32 having a polystyrene reduced number average-molecular weight (Mn) of  $1.49 \times 10^3$  (see paragraphs [0130]-[0132]). Polymers of Formula 32 are disclosed for the same use as polymers of Formula 30. One of ordinary skill in the art at the time of the invention would have reasonably expected that polymers of Formula 30 having a similar Mn to that of the polymer of Formula 32 would be suitable for use in Lamansky's invention.

Present claims 3, 4 and 10 further define aryl group (A). Aryl group (A) is a component of the repeating unit of formula (1). While further defining aryl group (A), claims 3, 4 and 10 are not limited to a polymer comprising a repeating unit of formula (1). Lamansky et al. suggest polymers within the scope of claims 3, 4 and 10 wherein the polymer is a polymer of claim 1 comprising a repeating unit of formula (2).

With respect to present claim 5, Lamansky's polymers of Formula 30 suggest polymers within the scope of claim 5 wherein each of Ar<sub>5</sub> and Ar<sub>7</sub> is a group of formula (2P) wherein each

of Ra, Rb, Rc and Rd represents a hydrogen atom, and q is 1, and Ar<sub>6</sub> is a group of formula (2P) wherein each of Ra, Rb, Rc and Rd represents a hydrogen atom, and q is 2 (the other Ar variables not being present when each of l, m, o and p is 0).

With respect to present claim 11, Lamansky's polymers of Formula 30 suggest polymers within the scope of claim 11 wherein the polymer further comprises a repeating unit of formula (4), (6) or (7) wherein Ar<sub>12</sub> represents an arylene group, X<sub>2</sub> represents -N(R<sub>4</sub>)- and R<sub>4</sub> represents an aryl group.

The only limitation of a polymer compound according to present claims 5 and 11 that is not expressly taught with respect to Lamansky's Formula 30 is the number average-molecular weight limitation set forth in claim 1, which has been addressed above.

The polymers of Formula 30 are taught for use in a buffer layer of an organic electroluminescent device. The buffer layer also comprises an electron acceptor material as taught, for example, in paragraph [0067], and may also comprise a luminescent color converting material as taught, for example, in paragraph [0071]. The electron acceptor material meets the limitations of an electron transporting material per present claim 12. A luminescent color converting material meets the limitations of a light-emitting material per present claim 12.

With respect to present claims 13 and 14, Lamansky's teaching such as in paragraphs [0073]-[0077] suggest that polymers of Formula 30 may be used in an ink composition. The viscosity limitation of claim 14 is not expressly taught, but it would have been within the level of ordinary skill of a worker in the art at the time of the invention, as a matter of routine experimentation, to determine suitable and optimum viscosities for solutions to be used for

device fabrication. For example, one of ordinary skill in the art knows that it is easier to form thinner coatings/films with a less viscous solution.

With respect to present claims 15-17, Lamansky's buffer layer comprising a polymer of Formula 30 is a conductive film and an organic-semiconductor thin film. The layer is also a luminescent thin film when a luminescent color converting material is included per teachings as in paragraph [0071].

With respect to present claims 18-24, see paragraphs [0001]-[0002] and [0025]-[0026] for example. Further with respect to claims 19 and 20, the buffer layer will also be a light emitting layer when a luminescent color converting material is included per teachings as in paragraph [0071].

8. Claims 1, 3-10 and 12-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Towns et al. (US 2001/0037012 A1).

See the entire published application. In particular, see paragraphs [0013]-[0016], [0026]-[0031], [0050] and [0066]-[0070].

A homopolymer having repeating units of formula (15) as shown in paragraph [0028] has the same structure as a polymer compound comprising a repeating unit represented by formula (1) as defined in present claim 1 wherein a is 1, b is 0, each of Ar<sub>1</sub>-Ar<sub>3</sub> is an arylene group, and each of E<sub>1</sub> and E<sub>3</sub> is a heterocyclic group (B) having two aryl groups as substituents wherein the total number of substituents and hetero atoms for (B) is five. A homopolymer having repeating units of formula (15) as shown in paragraph [0028] also has the same structure as a polymer

compound comprising a repeating unit represented by formula (2) as defined in present claim 1 wherein n is 2, each of l, m, o and p is 0, each of Ar<sub>5</sub>-Ar<sub>7</sub> is an arylene group, and each of E<sub>8</sub> and E<sub>9</sub> is a heterocyclic group (B) having three hetero atoms and having two aryl groups as substituents. Towns et al. do not expressly teach a number average-molecular weight for the polymers as required by present claim 1. It would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable and optimum number-average molecular weights for the prior art polymers. Given Towns' teachings such as in paragraph [0050], it is the examiner's position that one of ordinary skill in the art at the time of the invention would have been lead to polymers having number-average molecular weights within the presently recited range.

Present claims 3, 4 and 10 further define aryl group (A). Aryl group (A) is a possibility for the E variables in the repeating unit of formula (1). While further defining aryl group (A), claims 3, 4 and 10 are not limited to a polymer comprising a repeating unit of formula (1) wherein the E variables are aryl group (A). Towns et al. suggest polymers within the scope of claims 3, 4 and 10 wherein the polymer is a polymer of claim 1 comprising a repeating unit of formula (1) wherein the E variables are heterocyclic group (B). Towns et al. also suggest polymers within the scope of claims 3, 4 and 10 wherein the polymer is a polymer of claim 1 comprising a repeating unit of formula (2).

With respect to present claim 5, a homopolymer having repeating units of Town's formula (15) has the same structure as a polymer compound comprising a repeating unit represented by present formula (2) wherein each of Ar<sub>5</sub> and Ar<sub>7</sub> is a group of formula (2P)

wherein each of Ra, Rb, Rc and Rd represents a hydrogen atom, and q is 1, and Ar<sub>6</sub> is a group of formula (2P) wherein each of Ra, Rb, Rc and Rd represents a hydrogen atom, and q is 2 (the other Ar variables not being present when each of l, m, o and p is 0).

With respect to present claims 6-9, a homopolymer having repeating units of Town's formula (15) has the same structure as a polymer compound comprising a repeating unit represented by present formula (2) wherein each of E<sub>8</sub> and E<sub>9</sub> is a heterocyclic group (B') as defined in claim 6 (the other E variables not being present when each of l, m, o and p is 0). While claims 7-9 further define aryl group (A'), claims 7-9 are not limited to a polymer comprising a repeating unit of formula (2) wherein the E variables are aryl group (A').

With respect to claims 12-24, see paragraphs [0066]-[0070] in particular.

Further with respect to present claim 14, Town et al. do not disclose the viscosity of a composition comprising the polymer. It would have been within the level of ordinary skill of a worker in the art at the time of the invention, as a matter of routine experimentation, to determine suitable and optimum viscosities for compositions to be used for device fabrication. For example, one of ordinary skill in the art knows that it is easier to form thinner coatings/films with a less viscous solution.

Further with respect to present claims 21-24, it was known in the art at the time of the invention to incorporate EL devices into displays. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to incorporate an EL device according to Towns et al. in types of displays in which EL devices were known to be useful at the time of the invention.

9. Claims 1, 3-5, 10, 13-18 and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (WO 98/06773).

Wu's poly(arylamine) of Formula (I) as shown on page 2 wherein each x is 1 has the same structure as a polymer compound comprising a repeating unit represented by formula (2) as defined in present claim 1 wherein n is 1 or 2, each of l and m is 1, each of o and p is 0, each of Ar<sub>5</sub>-Ar<sub>9</sub> is an arylene group, and each of E<sub>8</sub> and E<sub>9</sub> is an aryl group. While each of the specific examples of polymers disclosed by Wu et al. is a poly(arylamine) of Formula (I) wherein each x is 0, the polymers in which each x is 1 would have been *prima facie* obvious to one of ordinary skill in the art, and would result from homopolymerization of the monomer of formula (III) as shown on page 5. Wu et al. do not expressly teach a number average-molecular weight for the polymers as required by present claim 1. It would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable and optimum number-average molecular weights for the prior art polymers. Given Wu's teachings such as at page 4, lines 20-32, it is the examiner's position that one of ordinary skill in the art at the time of the invention would have been led to polymers having number-average molecular weights within the presently recited range.

Present claims 3, 4 and 10 further define aryl group (A). Aryl group (A) is a component of the repeating unit of formula (1). While further defining aryl group (A), claims 3, 4 and 10 are not limited to a polymer comprising a repeating unit of formula (1). Wu et al. suggest polymers within the scope of claims 3, 4 and 10 wherein the polymer is a polymer of claim 1 comprising a repeating unit of formula (2).

With respect to present claim 5, Wu et al. teach on page 5 that a preferred monomer is a dihalogenated N,N,N',N'-tetraaryl-1,4-phenylenediamine. A homopolymer made from a dihalogenated N,N,N',N'-tetraaryl-1,4-phenylenediamine of Wu's formula (III) provides a polymer having the same structure as a polymeric compound comprising a repeating unit represented by present formula (2) wherein each of Ar<sub>3</sub> and Ar<sub>7-9</sub> is a group of formula (2P) wherein each of Ra, Rb, Rc and Rd represents a hydrogen atom, and q is 1, and Ar<sub>6</sub> is a group of formula (2P) wherein each of Ra, Rb, Rc and Rd represents a hydrogen atom, and q is 2 (the other Ar variables not being present when each of o and p is 0).

With respect to present claims 13-18 and 21-24, see for example, page 1, lines 2-4, p. 2, l. 8-13, p. 4, l. 11-17, and p. 10, l. 23-p. 11, l. 21.

Further with respect to present claim 14, Wu et al. do not disclose the viscosity of a solution comprising the polymer. It would have been within the level of ordinary skill of a worker in the art at the time of the invention, as a matter of routine experimentation, to determine suitable and optimum viscosities for solutions to be used for device fabrication. For example, one of ordinary skill in the art knows that it is easier to form thinner coatings/films with a less viscous solution.

Further with respect to present claims 21-24, it was known in the art at the time of the invention to incorporate EL devices into displays. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to incorporate an EL device according to Wu et al. in types of displays in which EL devices were known to be useful at the time of the invention.

Art Unit: 1794

10. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 7:00 a.m. to 3:30 p.m. Monday-Friday.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

/Marie R. Yamnitzky/  
Primary Examiner, Art Unit 1794

MRY  
April 07, 2008